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ABSTRACT

Over a three-year period, researchers at Harvard Project Zero investigated metaphoric abilities in children, documenting the development of their metaphoric production, comprehension, and preference, as well as the interrelationships among these skills. Two other areas of literary skills that were investigated were the child's understanding of nonliteral "tropes," such as irony and understatement, and the child's understanding of the role of fantasy and imagination in the construction of a fictional world. This report discusses the researchers' principal findings, placed in the context of previous work conducted in these areas of study. The first section of the report explores the development of metaphoric production including first metaphors, the decline of metaphor production in the elementary school years, and the production of analogies during the elementary school years. The second section discusses the development of metaphoric comprehension, with emphasis given to the ways children interpret metaphors and the misunderstanding of the metaphor as a problem of competence or performance. The three remaining sections explore the development of metaphoric preferences, understanding other kinds of figurative language, and understanding the role of imagination in constructing a story. Attached is a two-page reference list, along with examples of student responses to such metaphors as magical, metonymic, primitive, genuine, inappropriate, and incomplete. (HOD)

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FINAL REPORT

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THE DEVELOPMENT OF METAPHORIC OPERATIONS

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Introduction

Over the past three years, researchers at Harvard Project Zero have continued to pursue a program of research on metaphoric abilities in children. The development of metaphoric production, comprehension, and preference, as well as the interrelationships among these skills, has been documented. Two other areas of literary skill were also investigated: the child's understanding of non-literal "tropes" such as irony and understatement; and the child's understanding of the role of fantasy and imagination in the construction of a fictional world. What follows is a report of our principal findings, placed in the context of previous work that has been conducted in these areas of study.

I. The Development of Metaphoric Production

A. First Metaphors

An eighteen month old child that we observed noticed that his big toe was sticking out of a hole in his sock. He wiggled his toe, pointed at it and laughingly announced "turtle". The adults who witnessed this were delighted. They could see the resemblance between the toe sticking out of its sock and a turtle's head protruding from its shell. Moreover, no one had ever pointed out to the child such a resemblance. Thus, this "renaming" appeared to be a genuinely novel invention.

In the initial stages of language development, children often use words in such unconventional ways. For instance, we have observed a two year old pick up a red ball, pretend to eat it, and then gleefully announce, "apple!" A three year old pointed to a red and white stop sign and called it a candy cane. And a four year old looked up in the sky, saw a streak of skywriting, and said, "Look, the sky has a scar on it!"

Utterances such as these have been noted by many observers of child language (Bowerman, 1977; Carlson and Anisfeld, 1969; Chukovsky, 1968; Clark, 1973; Guillaume, 1927; Nelson, 1974). Such word usage has generally been interpreted as evidence of underdeveloped lexical knowledge: it is assumed that the child who called the ball "apple" has an overly broad meaning for the word "apple". That is, he believes that this word applies to all red spheres (e.g., Clark, 1973; Gombrich, 1961). Thus, calling the ball "apple" is seen as an instance of "overextension".

The assumption that the child who calls the ball an apple is speaking literally but incorrectly is plausible, but no more so than a rival interpretation. In applying a word to a referent to which this word does not conventionally apply, the child may be creating a metaphor. The child who calls the ball "apple" may know full well that his ball is not <u>really</u> an apple; rather, it reminds him of an apple. Calling the ball "apple" may be his only means (given that he has not yet fully mastered language) of expressing the idea that the ball <u>looks</u> like an apple.

The controversy between those who view early misnomers as metaphors and those who view them as overextensions is a difficult one to adjudicate. What counts as a convincing example of metaphor in the eyes of one observer may be another investigator's overextension. If one considers utterances such as those reported above without taking into account the child's lexical development, the context in which the utterance was produced, and the affective components involved, the conflicting interpretations fit the data equally well.

What is needed, then, are not more delightful examples of unconventional word use, but the construction of a set of criteria by which early metaphors can reliably be distinguished from unintentional overextensions. This we have attempted to do (Winner, 1979; Winner, McCarthy, Kleinman, and Gardner, 1979). Spontaneous speech samples of three children (between

eighteen months and five years) were collected, instances of unconventional word usage were noted, and a set of guidelines constructed to distinguish metaphors from mistakes (Winner, 1979; Winner McCarthy, Kleinman, and Gardner, 1979; Winner, McCarthy, and Gardner, 1980). For instance, if the child who called the ball "apple" had previously correctly referred to it as a "ball", we can infer that he was deliberatley overriding the literal name in favor of the novel one. Two other pieces of evidence tell us that this utterance was not a mistake: the child laughed as he renamed the ball; and he did not actually try to eat the ball, but only pretended to.

From this investigation, a profile of early language development has emerged in which metaphor plays a significant role. Most of the time, of course, the children whose speech we studied used words according to convention. However, when they did use words unconventionally, by far the major portion of such word use proved genuinely metaphoric (72-91%, across children).

Our studies allow the following conclusions. Early metaphors grow out of symbolic play, in which the child pretends, through gesture, that an object is something else (e.g., pretending to eat the ball, as if it were an apple). Often, once the child has transformed the object through pretend action, he will rename the object accordingly (e.g., apple). We have come to call such metaphors enactive. Examples abound: an eighteen month old slithered a toy car up his mother's arm, making it act like a snake, and said "snake". A two year old rubbed his furry teddy bear against the arm of a chair and then called the bear "zucchini" and the chair arm "grater". And a three and a half year old, holding a yo-yo up to his chin, called it his "beard".

Another kind of early metaphor emerges independently of symbolic play. The eighteen month old who called his toe a "turtle", the three year old who called a red and white stop sign a "candy cane", and the four year old who called skywriting a "scar" offer examples of purely perceptual metaphors. Perceptual metaphors stand alone without the support of action.

In the speech samples of the three children studied, a uniform developmental pattern was found: enactive metaphors declined with age, while perceptual metaphors increased with age. Both kinds of metaphors were found in all three children. But whereas one child's first metaphors were entirely enactive, and gave way slowly to perceptual renamings, the other two children's first metaphors included both types, and their later metaphors were almost entirely perceptual. Further evidence for these patterns of individual differences came from a cross-sectional study in which metaphoric renamings of objects were experimentally elicited (Winner, McCarthy, and Gardner, 1980; Winner, McCarthy, Kleinman, and Gardner, 1979). Here, some children were more likely to produce a metaphor when they were allowed to handle the object to be renamed; others did better when only permitted to look at the object to be renamed.

Of course, first metaphors are very different from those produced by adults. The preschooler's metaphors consist simply in applying new names

to physical objects. These new names are based on the physical properties of objects--most often on what can be done with them and on their shapes--rather than on affective aspects of experience. One does not find psychological metaphors in early language, for instance (e.g. likening an unfriendly person to an ice cube). And early metaphors are uttered only in the immediate, tangible presence of the eliciting object: the topic of an adult's metaphor, however, needs only to be imagined; the presence of the eliciting object is not necessary for the production of the metaphor. While early metaphors are thus more restricted in form than those of the adult, as argued by Gardner and Winner (in press), this early capacity for playfully renaming objects may be a necessary investment for later, full-blown forms of metaphor. Child metaphors are constructed along the same lines as are those of the adult's: both are grounded in a resemblance between disparate elements, and both entail an overriding of the conventional rule governing the extension of a particular word.

B. The Decline of Metaphor Production in the Elementary School Years

While preschoolers delight in giving new names to familiar objects, older children shy away from such unconventional language usage. Ten year olds are likely to insist on calling things by their rightful names. When they encounter a metaphor in the speech of another person, they may well protest. For instance, in one of our comprehension studies (to be descibed below), a ten year old who heard a sentence in which a stubborn person was likened to a rock insisted that one ought not to use words in this way, since a person is not a rock! Billow (1981) studied the spontaneous speech of children between 2½ and 8 years. He found that spontaneous metaphors peaked in frequency during the third year of life, remained common until the sixth year, and declined during the next two years. Snyder (1979) and Marti (1979) also found that the frequency of spontaneous metaphorical usage declined during the years of middle childhood.

The same decline appears to occur in tasks designed to elicit metaphorical language. Pollio and Pickens (1974) found that the frequency of novel metaphors declined steadily between grades 3 and 11. Gardner et al. (1975) found that the production of novel similes declined after the preschool years to a low level in the elementary school and high shcool years. For instance, asked to complete this sentence, "The room was quiet as...," one four year old in Gardner et al.'s study responded "as quiet as a magic marker," presumably because of the noiseless way in which a marker can glide over paper. Typical ten year old responses, "as quiet as a mouse," or "as quiet as a whisper", were less striking and more trite. The production of novel similes rose again among college age subjects. Thus, in Gardner et al.'s (1975) study, the two populations that produced the the highest number of "good" similes were four year olds and adults.

Thus, it appears that the course of metaphor, from early renaming to its adult form, is not a directly linear one, but follows a U-shaped curve. The preschooler's frequent use of metaphor declines in the years of middle childhood, not to resurface until adolescence.

If the creation of metaphor is so natural to the preschooler, then why

does metaphoric activity decline with age? In our view, the years of middle childhood can be thought of as a period of literalism or conventionalism. In language, children seem to want to master the conventional uses of words, just as in drawing they want to master the conventional rules of graphic representation. Increasing reliance on rules can also be found in the moral and social domains (Kohlberg, 1969; Piaget, 1965). Whether this literalism is due to formal schooling, which teaches the child to follow rules and give correct answers, or whether it is a natural developmental process, is not known.

C. The Production of Analogies During the Elementary School Years

While metaphors are infrequently heard in the speech of elementary school children, the ability to produce metaphors remains intact during middle childhood. The problem seems to be one of motivation. When placed in a situation in which the rules signal that it is desirable to make metaphors, literal age children have no difficulty producing novel figures of speech (Winner, McCarthy and Gardner, 1980; Winner, 1975). Moreover, while ten year olds are unlikely to spontaneously rename objects as the four year old does, they may well create extended analogies. For instance, in trying to understand the concept of side effects caused by medicine, we observed one ten year old who asked her mother whether side effects were like using scissors to open a can and bending the scissors in the process. Such an analogy differs from preschool metaphors in several respects. To begin with, it is less "risky", because the child has not applied a word in an unconventional way, but has simply compared two things. And, while the four year old renames physical objects, the ten year old analogizes about abstract concepts such as side effects.

Yet there are also important similarities between these two behaviors. Renaming objects on the basis of physical similarities may help the preschooler to make sense of the world: by noting resemblances among objects, his environment becomes less chaotic and more organized. Similarly, the analogies of the older child usually occur as the child is trying to understand a new concept. Relating the new and the abstract to something concrete and familiar helps the ten year old, no less than the four year old, to make sense of his world.

The use of analogy in the grade school years was documented in a study by Mendelsohn, Gardner, and Winner, (1981). Children in 2nd, 4th, 5th, and 6th grades were asked to explain three different types of concepts to a puppet "from Neptune", who knew nothing of life on earth. This paradigm was used in an effort to simulate the kinds of situations when children are likely to spontaneously invent analogies: such analogies are most often heard as children are trying to make sense of a new concept.

This study indicated that the tendency to explain by constructing analogies increases with age, as does the amount of originality in the analogy produced. A decline in the originality of analogies was found among 4th graders, most probably due to the onset of the "literal" stage.

II. The Development of Metaphoric Comprehension

Without the ability to make sense of figurative language, most works of literature would be partially understood at best. No less than adult literature, children's literature is filled with metaphorical language. In fairy tales, kings have wills of iron, stepmothers have hearts of stone, and princesses have apple cheeks. Other kinds of tropes can also be found in children's literature: hyperbole, understatement, sarcasm, and even irony.

It is not only in literature that children encounter figurative language. Adults often use such language in their speech to children [e.g., "Your eyes are saucers" (metaphor), "You've made a bit of a mess here" (understatement), "You are the cutest little boy in the whole world" (hyperbole)]. And figurative language, especially metaphor. is frequently used in grade school texts (Arter, 1976).

Because of its prevalence, it is tempting to assume that figurative language is understood by children. However, simply ask a six year old what it means to say that someone has a "hard heart," and one is likely to be told, quite confidently, that this person's heart was fashioned out of rock.

Studies of children's understanding of figurative language have focused on the area of metaphor. The results of these studies prohibit any simple conclusion about children's ability to understand metaphor. The answer to the question, "Can children understand metaphor", appears to be, "It depends." What it depends on are the measures used to assess comprehension as well as the kinds of metaphors whose comprehension is in question.

Research in our laboratory has addressed the following issue: is misunderstanding metaphor a problem of competence or performance? To answer this question we have asked three questions:

A. How do children interpret various types of metaphors?

B. Does the use of a nonlinguistic response mode reveal comprehension at an earlier age?

C. Does the surface form of a metaphor pose an obstacle to its comprehension?

A. How do children interpret metaphors?

1. Paraphrase Tasks

Beginning with a pioneering study by Asch and Nerlove in 1960, a number of studies of metaphor comprehension were carried out which yielded a picture of metaphor as a relatively late acquistion. Asch and Nerlove examined children's understanding of "double-function"

adjectives such as sweet, hard, cold, or crooked. These adjectives have a physical and a psychological meaning: a stone is literally hard; an unkind person is metaphorically hard. Children between the ages of three and twelve were tested for their understanding of both senses of these terms, as well as for their ability to explain the link between the two uses.

Children were first able to understand only the physical meaning of double-function terms. Seven and eight year olds understood the psychological sense, but they understood it as entirely separate from the physical meaning, insisting that there was no connection between the two. Only the oldest were able to pinpoint the links, explaining, for example, that "hard things and hard people are both unmanageable (p. 53). These findings were later replicated by Lesser and Drouin (1975).

While Asch and Nerlove examined children's understanding of metaphorical uses of isolated words, a study in our laboratory probed understanding of metaphorical sentences in which these words were embedded. Winner, Rosenstiel and Gardner (1976) asked children between 6-14 years to make sense of two kinds of metaphorical statements: psychological-physical metaphors containing double-function terms which could refer to both the psychological and the physical domains (e.g., "After many years of working at the jail, the prison guard had become a hard rock that could not be moved."); and with double-function terms that referred to two sensory domains (e.g., "The smell of my mother's perfume was bright sunshine."). Children in one condition were asked to explain, in their own words, the meaning of such sentences (the Explication Condition). In another condition, children were asked to select, from a choice of four, their preferred interpretation (the Multiple-Choice Condition). The three erroneous choices were constructed on the basis of the types of misinterpretations that children of different ages were observed to make during pilot testing.

Table 1 presents the four choices for the prison-guard sentence cited above. The magical interpretation maintains the literal meaning of the sentence; plausibility is achieved by envoking a magical world in which the laws of the natural world do not apply. In the metonymic interpretation the sentence is rephrased so that the two terms of the metaphor can both be interpreted literally without defying reality; plausibility is achieved by relating the two terms through contiguity rather than through identity. In the primitive metaphorical interpretation, although the statement is interpreted nonliterally, the double-function term retains its literal meaning. In the genuine metaphoric interpretation, the double-function term is interpreted in its metaphorical sense.

These four types of interpretation were hypothesized to represent four levels of metaphoric comprehension. This hypothesis was supported by children's responses to both psychological-physical and cross-sensory metaphors in both conditions. Six, seven, and eight year olds favored metonymic and primitive-metaphoric paraphrases. Although no age group preferred magical interpretations, children between six and eight years had

significantly more magical responses than did older children. Although ten year olds demonstrated a basic understanding of metaphor, they were often unable to explain their interpretations. And sometimes they reverted to a primitive-metaphoric or even a metonymic interpretation when pressed to justify their original genuine-metaphoric interpretation. Thus, metaphoric understanding was at first established on only a rather fragile basis.

An interesting finding was that, just as children began to "outgrow" primitive-metaphoric responses, they tended to offer "inappropriate-metaphoric" interpretations. In such responses, children offered a metaphorical interpretation of the double-function adjective, but the wrong psychological or sensory dimension was grasped. For example, the prison-guard statement was sometimes interpreted to mean that the guard was fussy. It is noteworthy, however, that while an incorrect psychological dimension was sometimes stated, the positive or negative polarity of the double-function term was always respected. Children sensed that hard applied to a person had a negative connotation; and while they might conclude that the prison guard was fussy, they never concluded that he was kind. Thus, a sensitivity to the specific dimension referred to by a double-function term (e.g., degree of kindness) is achieved after a sense of the more general polarity connoted. [The finding, that polarity is recognized prior to dimension, was replicated in a study designed to test just this hypothesis (Winner, Wapner, Cicone, and Gardner, 1979).] This study showed that children are unable to explain psychological-physical or cross-sensory metaphors until middle childhood, at least when these metaphors stand on their own, outside of a linguistic or physical context.

2. Understanding the Psychology in Psychological Metaphors

It has been suggested that children's difficulty with psychological metaphors stems not from an inability to understand metaphor, but rather from an unfamiliarity with the topics of such metaphors: character traits and emotional states (Ortony, Reynolds, and Arter, 1979). If children do not characterize people along characterological dimensions, such as flexible, cruel, stern, yielding, etc., of course they would not be able to understand metaphoric references to such states.

To test this possibility a follow up study was carried out by Cicone, Gardner, and Winner (1981). Six, seven, and nine year olds heard brief stories describing the behavior of a person. For instance, one of the vignettes featured a description of a person who ordered everyone around and always got his way. After each story children were given a choice of three terms with which to describe the person in the story. Half of the time the choices yielded metaphorical descriptions of the character, half of the time they yielded literal descriptions. For instance, the correct metaphorical characterization of the person who always got his way was "a bulldozer in a parking lot." The correct literal description was "bossy."

If the difficulty with psychological-physical metaphors found by Winner, Rosenstiel and Gardner is due to an inability to talk about characterological traits, then children should perform equally poorly when given literal or metaphorical choices. However, in fact, children at all ages performed significantly better when given literal trait names than when given metaphorical choices. Thus, difficulty posed by psychological-physical metaphors is not due to a lack of knowledge of the psychological domain.

3. The Role of Semantic Distance Between Topic and Vehicle

There are at least two other possible reasons why psychological-physical metaphors are difficult to children to understand. First, the semantic distance between the topic and vehicle is large: a person and an inanimate physical object are very different. Second, the link between topic and vehicle is abstract.

To test the role of semantic distance between topic and vehicle in metaphor comprehension, grade school children were given stories ending in psychological metaphors which varied in the distance between the two terms linked (Miller, Gardner, and Winner, in preparation). One kind of metaphor linked a person to an animal (e.g. Brian (who in the story was seen as angry) was like a snarling tiger). A second kind linked a person to a moving object (e.g. Brian was like a thundering cloud). And a third kind linked a person to a static object (e.g. Brian was like a ticking bomb).

Comparisons between people and animals span the least semantic space (both are animate, moving objects); comparisons between people and static objects span the greatest distance (they share neither animacy nor the fact of "moving on their own"); comparisons between people and moving objects open an intermediate distance (they share the fact of "moving on their own", but not animacy). It was hypothesized that difficulty of comprehension should vary with the degree of distance between topic and vehicle. Results indicated that psychological metaphors linking people to animals were significantly easier to understand than those linking people to moving objects. Contrary to prediction, those linking people to static objects were intermediate in difficulty, and not significantly different from either of the other two kinds.

The fact that person-animal links were easier to understand suggests one reason why psychological metaphors pose difficulties for children: these metaphors entail a relatively large distance between topic and vehicle. If this distance is narrowed, comprehension is facilitated.

4. The Role of The Abstractness of the Topic-Vehicle Link

To test the second possibility--that psychological metaphors are difficult because of the abstractness of the link between topic and vehicle--children's sensitivity to five types of similarity, varying in degree of abstractness, was assessed (Mendelsohn, Gardner, and Winner, 1981). The types of similarity were: perceptual, affective, conceptual, psychological, and cross-sensory. Fifteeen children in each of grades 1, 3, and 5 were given an incomplete sentence (e.g. A yo-yo going up and

down is like...) and were asked to select one of three possible endings. One of the endings created an appropriate metaphorical link; one was an associate of the topic; and one was entirely inappropriate. For any particular item the appropriate ending was one of the following kinds: affective (for the yo-yo item: a ticket to the circus); cross-sensory (a heart thumping); conceptual (weather that keeps changing from sun to rain); psychological (a person who keeps changing his mind); and perceptual (a rabbit hopping through the grass).

The ability to perceive similarities was found to depend on the nature of the elements being linked rather than the abstractness of the link itself. Thus, regardless of whether the link was abstract or perceptual, connections between two concrete elements were easier to grasp than those between a concrete and an abstract element, or between elements of different sensory modalities. Children as young as six were able to recognize abstract similarities that linked concrete visual elements. Furthermore, it was discovered that perceptual and affective metaphors were easiest to understand; cross-sensory and psychological were most difficult; and conceptual was of intermediate difficulty for the children tested.

B. Is misunderstanding metaphor a problem of competence or performance?

Both Asch and Nerlove and Winner et al. concluded that understanding nonperceptual metaphors is a late developing skill. Underlying this conclusion is the assumption that misunderstanding metaphors stems from a cognitive limitation such as the inability to perceive abstract resemblance. But misunderstanding may not arise from limitations of the child's competence, but may be due to more superficial problems. There are at least two possible performance problems that might account for misunderstanding metaphor: difficulties caused by a linguistic response mode; and obstacles posed by the surface form of a metaphor.

1. Does the use of a nonlinguistic response mode reveal comprehension at an earlier age?

Both Asch and Nerlove and Winner et al. (1960, 1979) assessed comprehension through tasks in which children must put their understanding into words. In other areas of language, such metalinguistic skills (i.e., the ability to use language to talk about language) develop later than the ability to simply understand language. For instance, children can tell the difference between grammatical and deviant sentences long before they can explain why one is correct and the other incorrect. Thus, the studies just discussed may tell us more about the ability to explain than to understand metaphoric language.

When understanding is assessed nonlinguistically, even preschoolers show some understanding of metaphors based on nontangible grounds. In one such study, Gardner (1974) devised a simple matching task. Subjects from three and a half to nineteen years heard pairs of opposite adjectives

(e.g., hard/soft; cold/warm) and were asked to align each member of a pair with a pair of visual stimuli. For instance, hard/soft had to be aligned with two colors (a brown color swatch/a blue-gray swatch), two pictured facial expressions (a frowning face/a smiling face), and two sounds (the sound of a triangle/the sound of a recorder). A metaphoric response, according to adults, consists in aligning the word hard with brown, a frowning face, and the sound the triangle; and the word soft with the other member of each pair.

Preschool children were able to match the adjectives to the various stimuli in a metaphorical manner, although of course, they did not do so as consistently as did older children and adults. That they could align hard with the frowning face, and soft with the smiling one indicates that the ability to perceive the abstract connection between a physical and a psychological property is present long before the child can paraphrase metaphors based on such links. However, since Gardner used a simple two-choice paradigm, a correct score could be achieved for the wrong reason (e.g., aligning hard with the frowning face because the person's nose looked hard). Because children could not explain their matches, one cannot be certain that the matches were in fact metaphorical for the preschoolers.

The use of a nonlinguistic response mode has not only demonstrated possible sensitivity to abstract metaphors in preschoolers: it has also revealed a form of incipient sensitivity to metaphoric resemblances in prelinguistic infants. We have demonstrated that infants between 9 and 12 months are able to recognize abstract connections between certain visual and auditory stimuli (Wapner, Winner, Cicchetti, and Gardner, 1981). These connections are similar to those that underlie "cross-sensory" metaphors linking auditory and visual elements, as in expressions such as "a loud color," "a low tone."

In this study, infants heard a sound (e.g., a pulsing tone) that lasted for ten seconds. Three seconds after the onset of the sound they were shown two slides simultaneously (e.g., a picture of a dotted line and a continuous line). Later on, infants saw the same two slides, but this time they saw them while listening to a continuous tone. On several of the stimuli sets used, infants were found to match their looking preferences to the sound to which they were simultaneously listening. Thus, while listening to the pulsing tone, they preferred to look at the dotted line; and while listening to the continuous tone, they shifted their preference to the continuous line. (Similar findings, using a different method of assessment, were reported by Lewkowitz and Turkewitz, (1980), who showed that infants could perceive a resemblance between brightness [visual] and loudness [auditory].)

The connections that infants were able to perceive between sounds and patterns in our study are no different, in principle, from those that underlie cross-sensory metaphors in language. We refer to colors as "loud" or "quiet" and musical pitches as "high" or "low", presumably

because we are able to perceive links between sounds and sights. The finding that even infants can make such connections suggests that many of our common metaphors may be determined by nonarbitrary connections that are first perceived nonlinguistically.

2. Does the use of context affect comprehension?

Just as the use of a non-linguistic response mode lowers the age of comprehension, the presentation of metaphors in a context also lowers the age at which metaphors are understood. The facilitating effect of context occurs even when the response mode used is metalinguistic. For instance, shown pictures of an angry and calm person, and asked to select the one that is "a jagged piece of glass", children can easily pick out the angry face (Winner, Wapner, Cicone, and Gardner, 1979). Then asked to explain what it means to call someone a jagged piece of glass, children as young as six are able to offer appropriate paraphrases. Thus, presentation of psychological metaphors within a pictorial context facilitates comprehension. And, of course, it is often in such situational contexts that metaphors are encountered.

The presentation of metaphors in a story context also facilitates comprehension. But if metaphors are to be presented in this way, one must avoid giving the meaning of the metaphor away by the prior context. For instance, given a story about a cruel prison guard described as a "hard rock," and asked to explain the metaphor, children could respond correctly by attending only to the story and not to the metaphor.

In a study designed to avoid this problem, children heard brief stories followed by incomplete sentences containing a psychological-physical metaphor (Winner, Wapner, Cicone, and Gardner, 1979). One of the stories described a girl getting ready to go to the movies with a friend. On her way out the door, she sees her little brother crying. He begs to be taken along. The story ends with, "Mary was such a jagged piece of glass that she..." Children were then asked to complete the story , describing what Mary did. If children completed the story by saying that Mary rejected her brother's plea, they were considered to have understood the metaphor. This requires a tacit, rather than explicit, awareness of what it means to call a person jagged. Children as young as six (the youngest tested) succeeded in this task.

It should be noted that the stories themselves did not divulge the meaning of the metaphors. The story about Mary does not tell us whether Mary is mean or kind: the story has simply set up the situation to which Mary will react. It should also be noted that not only were the metaphors presented in a linguistic context, but the response mode

required was nonmetalinguistic. Rather than paraphrase the metaphors, children were simply required to describe an action that a person described as jagged could be expected to carry out.

3. Does the surface form of a metaphor pose an obstacle to comprehension?

The studies just reviewed suggest that the relatively late emergence of comprehension reported by Asch and Nerlove and Winner et al. (1960, 1979) may be due in part to the response mode used and to the fact that the metaphors were presented out of context. The late age at which comprehension emerged in these studies may also be due to another potential obstacle: children may not know that it is permissible to use language in a nonliteral way. That is, they may fail on a metaphor task because they do not know what it is that they are supposed to do with a metaphor.

Metaphors are an indirect way of pointing out a similarity between two elements. A metaphor asserts that A is B, but the reader is supposed to understand this as "A is like B in some respects." If one takes a metaphor literally, it will be misunderstood. No such problems are posed by similes, however. Similes state directly what metaphors state indirectly. If the indirectness of a metaphor is an obstacle, then the child who fails to understand a metaphor ought to be able to understand a corresponding simile.

A study was designed to examine this possibility (Winner, Engel and Gardner, 1980). Children heard five types of statements, each of which encoded a metaphorical relationship (Winner, Engel, and Gardner, 1980) The same metaphorical relationship can be expressed in a number of linguistic forms besides metaphor. For instance, consider the resemblance between a streak of skywriting and a scar. One could capture this through a predicative metaphor (a metaphor in the form of A=B) (The skywriting was a scar marking the sky). Or one could capture the ground in a simile (The skywriting was like a scar marking the sky). The simile form is a direct way of saying what the metaphor says indirectly. The simile means exactly what it says, but the metaphor does not. Yet comprehension of both requires that one recognize the relationship between a streak of skywriting and a scar.

The same metaphoric ground can also be presented in the form of a topicless metaphor (A scar marked the sky). Here, the topic must be inferred. Topicless metaphors can be rewritten as four-term analogies in which comprehension entails generating one of the four terms (A scar marks the sky and a ___ marks the skin). In this case, comprehension requires generating the same missing term as does the topicless metaphor. However the analogy form renders the task of finding a missing term explicit. Finally, a topicless metaphor can be transformed into a riddle whose solution entails the generation of the same missing term (What is like a scar but marks the sky?). However, like the simile, the riddle renders the similarity relationship explicit by the term "like". Moreover, the riddle tells the listener exactly what to do: to find the missing term, answer the question posed. If children's difficulty with metaphors stems from an inability to discover the link between topic and

vehicle, then they should not be helped by receiving the metaphorical link in more direct, explicit form. If, on the other hand, difficulty with metaphors stems at least in part from the linguistic form in which they are encoded, then receiving the more direct forms should elevate performance.

The results clearly showed that altering the linguistic form can dramatically improve performance. Topicless metaphors proved significantly more difficult than both analogies and riddles. However, contrary to expectation, the presentation of predicative metaphors in simile form did not increase comprehension. Thus, the difficulty in understanding the metaphors used on this task did not stem from the fact that the metaphors expressed similarity relationships indirectly. Children appeared to recognize that a metaphor in the form of A is B really means A is like B. The difficulty lay in determining just how B could be like A, and this was a challenge posed equally by the metaphors and the similes.

It must be stressed that the metaphors used in this study were all perceptual metaphors. Had psychological-physical metaphors been used, it is possible that the similes would have been understood before the corresponding metaphors, since we know that 6 year olds often do interpret psychological metaphors literally.

It is also possible that these results may not be generalizable to "whole-sentence" metaphors for which both a literal and a figurative interpretation are permissible. The items used in the Winner et al. study yielded implausible statements if interpreted literally. Such implausibility may serve as a cue to transform the stated relation of equivalence to one of similarity. However, such a "within sentence" cue is not present in all metaphors. If one says that "Robert is a magician", this sentence could be intended literally (Robert does magic tricks) or metaphorically (Robert is a surgeon who has just saved someone's life). Out of context, both interpretations are equally plausible. Perhaps metaphors for which literal interpretations are plausible are not solved as easily as their corresponding similes, precisely because the sentence by itself is perfectly sensible on a literal interpretation.

A similar study using such whole sentence metaphors confirms this possibility (Reynolds and Ortony, in press). In this study, children ranging from second to sixth grade read brief stories and then selected what they considered to be the most fitting of four final sentences. The correct response was either a metaphor, a simile, or a literal statement. Children at all ages chose the correct literal sentences. Choosing the correct metaphors and similes proved more difficult. However, similes were chosen correctly at a level above chance by the 4th grade, while equivalent performance on the metaphors was not achieved until the fifth grade. Thus, before children could make sense of the metaphor: the worn out shoe was thrown into the trash (referring indirectly to the old, unwanted racehorse), they demonstrated the capacity to relate the disparate domains, old horses and old shoes, involved in

the story.

In a second experiment, Reynolds and Ortony compared the relative difficulty of topicless whole-sentence metaphors, and predicative metaphors such as those used in Winner et al.. Each of these two types of metaphor were also presented in simile form. Again children read stories and chose from a set of four topicless or predicative metaphors the best final sentence. For instance, one of the stories was about a child named Johnny who lent his baseball glove to a friend. The friend left it out in the rain and ruined it. Johnny's parents gave him a new glove but warned him not to let someone ruin it. Johnny decided not to let his friends even see his new glove. The correct topicless metaphor for this story was, "The dog buried the bone in the back yard." The corresponding simile was "He was like a dog burying the bone in the back yard." The correct predicative metaphor was, "Johnny was a dog burying a bone in the back yard." And the corresponding simile simply inserted <u>like</u> after the main verb.

Again, similes proved easier than metaphors. And this was the case even when the statements were in predicative form ("Johnny was a dog burying a bone in the back yard.." vs "Johnny was like a dog burying a bone in the back yard."). These results directly contradict those obtained by Winner et al. using predicative metaphors. However, in our study, a more difficult response mode was used: children either had to explain the ground or to select the most appropriate explanation of the ground. Reynolds and Ortony, however, required children simply to match a nonliteral statement to an appropriate context. By using this non-metalinguistic, and thus more sensitive measure, any difference that does exist between the demands of the similes and metaphors is more likely to be revealed.

As expected, making the topic specific facilitated comprehension. While second graders (7½ years) chose the correct predicative metaphor 43% of the time (when chance level performance would yield 25%), they chose the topicless metaphor at a level close to chance (29%). Not until fourth grade (9½ years) could children choose the correct topicless metaphor at a level above chance.

The evidence from Winner et al. and from Reynolds and Ortony suggests that metaphor comprehension may be impeded by the form in which the metaphor is posed. Children may fail on a metaphor task because they do not know the rules of the game. That is, they do not know what it is that they are supposed to do with a metaphor when they see one.

Taken together the studies discussed above converge to suggest that measures of children's ability to understand metaphor may be confounded with measures of other language variables or with performance factors. The purest measure of metaphor comprehension ought to allow a nonmeta-linguistic response mode, present the metaphors in a visual or verbal context, and encode the metaphoric relation in the form of a simile with both topic and vehicle stated. However, by radically simplifying

the tasks in this way, researchers may be measuring a relatively primitive form of metaphor understanding. Children who can explain a metaphor presented out of context are not just demonstrating better metalinguistic skills than the four year old who can match but not explain; they are also demonstrating a fuller understanding of metaphor. Thus, while one can find hints of metaphor comprehension in infants, one should not confuse these glimmerings with the full grown understanding of the preadolescent.

One final remark about the age at which metaphor comprehension emerges is warranted. Just as important as distinguishing among response modes is the need to distinguish among different types of metaphor. Those that require recognition of abstract, amodal links will be understood later than those which require recognition of a link within one sensory modality. No generalization about metaphor understanding should be made on the basis of studies investigating only one type of metaphor.

III. The Development of Metaphoric Preferences

While metaphor comprehension has been extensively studied, much less is known about the development of the aesthetic appeal of metaphors. Do children find a metaphorical description more appealing than a literal one? And if so, what types of metaphors are preferred at different ages? These questions were explored in our laboratory by Silberstein, Gardner, Phelps, and Winner (1980), using a multiple choice preference task in which children (and adults) were asked to indicate their preference for literal vs. metaphorical statements, and for different types of metaphors. This study demonstrated a preference for literal over metaphorical language by children between six and eight; preference for literal statements then declined steadily with age, with the exception of an unexpected return to literalism in the eighth and tenth grades. Unlike the youngest children who preferred literal completions, however, these eighth and tenth graders demonstrated an explicit awareness of what they were rejecting, often articulating a defiance of the nonliteral. For instance, one tenth grader wrote "I like to be more exact about things and more direct." By twelfth grade and college, preference for literal statements had given way to preference for metaphorical ones.

When children did demonstrate a preference for metaphorical language, at all ages, metaphors based on two grounds were preferred to those based on only one link For instance, they preferred "The popped red balloon is an apple peel" (based on color and shape) to "The popped red balloon is a limp washcloth" (based on shape alone). With respect to single-grounded metaphors, preferences shifted from static perceptual grounds based on constant features of objects (shape and color) to dynamic perceptual grounds based on transient properties of objects (movement and sound) to conceptual grounds based on nonperceptual similarities between objects.

A comparison of these results with findings from comprehension studies suggests that children may comprehend the basis for a metaphor quite some time before they like this metaphor. While fifth graders typically understand abstractly grounded metaphors, and while they demonstrated comprehension of those conceptual metaphors that they chose on this preference task (as assessed by the justifications given for their choices), it was not until tenth grade that a preference for the conceptual metaphors appeared. Unlike jokes, which children appreciate before being able to explain (Zigler, Levine and Gould, 1966, 1967) or enjoy most at the time that they initially understand them (McGhee, 1973), these findings suggest that metaphor appreciation lags behind comprehension. However, to confirm this preliminary finding, comprehension of all metaphors on the preference task would have to be assessed along with preferences to determine understanding of metaphors not chosen as well as those chosen.

IV. Understanding Other Kinds of Figurative Language

The place of metaphor in relation to other tropes is an area ripe for study. How do children understand other forms of nonliteral language frequently encountered in literature, forms such as hyperbole or sarcasm? Unlike metaphor, understanding these types of tropes requires not only that they be interpreted nonliterally: the listener must also grasp the speaker's motivation. For instance, suppose that a character in a story is depicted as very clumsy. After tripping in a race and falling flat on his face, his friend tells him, "You sure are a great athlete." To make sense of this statement, the reader must realize that the speaker's intent was to tease, rather than to compliment the fallen runner (i.e., to lie to him). Thus, understanding such tropes requires some awareness of human psychology.

In a study designed to investigate comprehension of hyperbole, understatement, sarcasm, and irony (Demorest, Winner, Silberstein, and Gardner, 1981), first graders were found to interpret all such statements literally. Third graders recognized these statements as nonliteral, but had difficulty grasping the speaker's intent. Typically, the child believed that the speaker intended to mislead his listener (i.e., to lie through flattery) and failed to see that the speaker and listener might have a shared understanding of the nonliteral truth of the statement. Only the sixth graders were able to recognize a shared perspective between speaker and listener in which both participants are aware of the nonliteral nature of the statement as well as the speaker's intent to tease or to convey a statement with rhetorical impact.

V. Understanding the Role of Imagination in Constructing a Story

Although our research focused on the development of metaphor, one study explored children's sensitivity to another important aspect of literature (Silberstein, Winner, Cadogan, and Gardner, 1980). In this study, we examined three issues: 1) children's awareness that an imagined event is the product of someone's mind; 2) their awareness that the imaginer has "control" over what happens in the fantasy; 3) and their understanding of the nature of fictional (imagined) characters and how these characters differ from "real" characters. An imaginary event was presented to children (aged 4, 7, and 10) in four versions: 1) the experimenter relates an imaginary event to the child--here the imaginary event is the product of the experimenter's imagination; 2) the experimenter reads the child a story--here the imaginary event is the product of an author's imagination; 3) the experimenter reads a story in which one of the story characters is said to imagine something--here the imaginary event is the product of the character's imagination, and this is explicitly stated; 4) the experimenter reads a story in which one of the story characters imagines something, but no explicit cue is given that the related event is being imagined.

After hearing the fantasy, each child was given an extensive clinical interview to assess his or her conception of imagination with respect to the three issues stated above. Children were found to pass through three stages in understanding imagination. In the first stage children do not readily realize that an imaginary event is the product of someone's mind. Nor do they believe that the imaginer has control over his imagination. Indeed, a fantasy is not differentiated from a real event. In the second phase, children recognize that the imaginary event is the product of someone's mind. But they do not yet realize that the imaginer controls his imagination by thought. Indeed, children conceive of control in physical terms--e.g., they state that the imaginer might have altered the story so that a broken car can work again by imagining that it had a motor. Never do they state that the imaginer could make the broken car work by simply "deciding" that it worked. The child does not yet recognize the total freedom available to the imaginer. In the third stage, the child is aware of the imaginer as both the source and the control of the fantasy. The child also realizes that such control is effected mentally and is not subject to real world constraints--i.e., in a fantasy, anything is permissible.

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Table 1: Responses to Sample Metaphors

Name	Example
Magical	The king had a magic rock and he turned the guard into another rock. Her perfume was made out of rays from the sun.
Metonymic	The guard worked in a prison that had hard rock walls. When she was standing outside in the bright sun she was wearing perfume.
Primitive metaphoric	The guard had hard, tough muscles. Her perfume was a bright yellow color like the color of the sun.
Genuine metaphoric	The guard was mean and did not care about the feelings of the prisoners. Her perfume had a wonderful smell.
Inappropriate metaphoric	The guard was old. Her perfume had a funny smell.
Incomplete metaphoric	It was a big rock. There was some perfume.